CLAIMS:

1. An apparatus for measuring electrical conductivity in a material, said apparatus comprising:

a pair of electrically conducting elements;

a first electrical conductor coupled to said electrically conducting elements, said first electrical conductor coupling a first transformer core and a second transformer core to form a first current loop; and

a second electrical conductor of known resistance coupling said second transformer core and a third transformer core to form a second current loop.

2. The apparatus of claim 1, wherein said electrically conducting elements are bolts or plugs or plates.

3. The apparatus of claim 1, wherein said first, second and third transformer cores are toroidal "C", "O" or "E" transformer cores or combinations thereof.

4. The apparatus of claim 1, wherein said first, second and third transformer cores are ferrite cores, laminated cores or powdered iron cores or combinations thereof.

5. The apparatus of claim 1, further comprising at least one mounting plate for mounting said electrically conducting elements, said at least one mounting plate attached to a container for said material.

6. The apparatus of claim 1, wherein said second current loop is partially formed by a metal loop attached to said mounting plate and electrically coupled to said electrically conducting elements, said metal loop supporting said first and second transformer cores.

7. The apparatus of claim 6, wherein said first, second and third transformer cores are coupled to said metal loop such that axes of the transformer cores are mutually perpendicular.

8. The apparatus of claim 1, wherein the centre-to-centre separation of said electrically conducting elements is between one and ten times the diameter of said electrically conducting elements.

9. The apparatus of claim 1, wherein, for measuring electrical conductivity in dairy fluids, the centre-to-centre separation of said electrically conducting elements is between three and four times the diameter of said electrically conducting elements.

10. The apparatus of claim 5, wherein the boundary of the at least one mounting plate is at least three times the diameter of said electrically conducting elements.

11. The apparatus of claim 1, wherein said first transformer core and said third transformer core each comprises a single secondary winding.

12. The apparatus of claim 5, wherein said container is a pipe and said at least one mounting plate extends longitudinally at least partially along said pipe or circumferentially at least partially around said pipe.

13. The apparatus of claim 12, wherein said electrically conducting elements extend the circumference of said pipe.

14. The apparatus of claim 13, further comprising insulating plate elements provided adjacent said electrically conducting elements and extending the circumference of said pipe.

15. A method of measuring electrical conductivity in a material, said method including the steps of:

mounting a pair of electrically conducting elements to be in contact with said material;

coupling said pair of electrically conducting elements with a first electrical conductor, said first electrical conductor coupling a first transformer core and a second transformer core to form a first current loop;

coupling said second transformer core and a third transformer core with a second electrical conductor of known resistance to form a second current loop;

measuring a voltage across said material with said first transformer core;

monitoring an excitation voltage across said second transformer core by measuring a reference voltage across said third transformer core; and

determining said electrical conductivity of said material from said voltage across said material, said reference voltage and said known resistance.

16. A method of measuring electrical conductivity in a material, said method including the steps of:

mounting a pair of electrically conducting elements to be in contact with said material;

coupling said pair of electrically conducting elements with a first electrical conductor, said first electrical conductor coupling a first transformer core and a second transformer core to form a first current loop;

coupling said second transformer core and a third transformer core with a second electrical conductor of known resistance to form a second current loop;

measuring a current through said material via a secondary winding of said first transformer core;

monitoring an excitation voltage across said second transformer core by measuring a reference current through a secondary winding of said third transformer core; and

determining said electrical conductivity of said material from said current through said material, said reference current and said known resistance.